

## RESEARCH PROJECT SEGMENT

*State:* Alaska

*Project No.:* F-9-3

*Name:* Sport Fish Investigations of Alaska.

*Study No.:* G-11

*Study Title:* Sport Fish Studies.

*Job No.:* G-11-B

*Job Title:* Anadromous Fish Population Studies -  
Upper Cook Inlet Drainage.

*Period Covered:* July 1, 1970 through June 30, 1971.

### ABSTRACT

Creel census data obtained during the 1970 special king salmon, Oncorhynchus tshawytscha, punch-card fishery disclosed 2,954 anglers fished an estimated 23,632 hours to catch 1,013 king salmon over 508 mm (20 inches) in length, a seasonal success rate of 0.34 fish per angler.

Of the 16,687 king salmon punch-cards issued, 75% were voluntarily returned to the Department of Fish and Game. A total of 5,614 anglers (45% of returned cards) indicated they had fished for king salmon.

The 1970 escapement of 6,095 king salmon to spawning areas in Upper Cook Inlet appears to be one of the highest on record.

Creel census data obtained from the Deshka River and Lake and Alexander creeks disclosed 219 anglers caught 332 adult silver salmon, O. kisutch, with a seasonal rate of success of 1.5 fish per angler.

For the first time in 10 years Ship Creek, located near downtown Anchorage, was open to king salmon sport fishing. An estimated 50 king salmon over 508 mm in length were caught.

## RECOMMENDATIONS

1. Retain the present objectives of the studies.
2. Emphasize the use of the Bendix Salmon Sonar Counter as a means for enumeration of adult salmon on the Deshka River. Conduct field tests to fully evaluate the counter as an enumeration device.

## OBJECTIVES

1. To determine the sport fish catch of king salmon and evaluate angling pressure effort in selected freshwater areas of Upper Cook Inlet.
2. To collect and analyze biological data concerning the distribution, abundance, timing, lengths, weights, age and sex compositions of adult salmon returning to selected freshwater streams of Upper Cook Inlet.
3. To conduct silver salmon harvest studies in selected fresh waters of the Susitna River.
4. To provide recommendations for the management of king and silver salmon in the fresh waters of the Susitna River.

## TECHNIQUES USED

Creel census was conducted during the king and silver salmon season to accumulate data on angling harvest. The catch per unit of effort was obtained from angler interviews. Lengths, weights, sex composition, and scales from king and silver salmon were obtained by sampling the angler's catch.

Aerial, river boat, and ground surveys were made to observe distribution, numbers, and time of arrival of adult king and silver salmon in Upper Cook Inlet streams.

Attempts were made to enumerate adult king and silver salmon in the Deshka River with a Bendix salmon counter.

## FINDINGS

Upper Cook Inlet stream description and past information collected on this project are presented in Dingell-Johnson Annual Reports of Progress by Stefanich (1961) and Kubik (1962 through 1969).

## Punch Card King Salmon Harvest

A total of 16,687 king salmon, Oncorhynchus tshawytscha, punch cards were issued to anglers for the entire Cook Inlet area during the 1970 season. This was an increase of almost 10,000 cards over the 1969 total (6,688). Seventy-five percent of the cards were returned to the Department of Fish and Game after the close of the season. Of the 12,518 punch cards voluntarily returned, 5,614 anglers (45%) indicated fishing for king salmon.

During the 1970 fishing season, an area quota of 1,000 king salmon over 508 mm in length was established for the Upper Cook Inlet area. This was an increase of 750 fish over the 1966-69 yearly quota of 250 king salmon. The daily bag limit remained at one king salmon per day, two kings per season. King salmon under 508 mm in length were considered part of the daily bag limit, which was "ten (10) in total of salmon under 16 inches in length; trout, grayling and char, provided the limit may not contain more than two (2) trout, lake trout or grayling over 20 inches in length."

The 1970 recorded punch card catch of king salmon over 508 mm for Upper Cook Inlet streams was 871 fish. An additional 262 kings under 508 mm were taken.

For the Upper Cook Inlet streams, 634 anglers were successful in landing one or two kings over 508 mm, as compared to 2,320 unsuccessful anglers. Anchorage residents accounted for 83% of the catch, other Alaskans 9%, nonresidents (out-of-state) 8%.

Extrapolation of the punch-card data provided an estimated sport catch of 1,013 king salmon over 508 mm in length for Upper Cook Inlet.

For the fifth consecutive year, the most productive stream was the Deshka River. Approximately 68% of the total king salmon catch was from the Deshka River. The annual harvest by stream for the years 1966 through 1970 is presented in Table I.

A sample of 598 sport-caught king salmon over 508 mm were measured for size composition (Figure 1). The salmon ranged in length from 508 - 1,194 mm, with a mean of 803 mm. Males averaged 734 mm, and females 894 mm.

A higher incidence of females was taken in the sport fishery during the 1970 season compared to previous years. This can be attributed to the availability of females during the later opening date, June 13. Prior to the 1970 season, the fishery usually began during the last week in May or the first week in June. Sex ratio of males to females in the sport fishery was 1.4:1 in 1970, as compared to 4:1 in 1969. The seasonal fishing period for 1970 was from June 13 through June 28.

TABLE 1 Summary of King Salmon Punch Card Harvest for Upper Cook Inlet, 1966-1970.

<u>Upper Cook Inlet</u>	<u>1970</u>	<u>1969</u>	<u>1968</u>	<u>1967</u>	<u>1966</u>
King salmon cards issued (entire Cook Inlet)	16,687	6,688	9,524	5,977	8,853
King salmon cards returned (entire Cook Inlet)	75%	70%	70%	82%	77%
Punch-card catch (over 508 mm)	871	339	398	315	263
Punch-card catch (under 508 mm)	262	81	416	167	163
<u>Stream Breakdown (KS over 508 mm)</u>					
Deshka River	579	310	324	234	205
Alexander Creek	286	21	71	20	28
Lake Creek	1	8	3	60	26
Chunilna Creek	5	--	--	1	4
Avg. size of kings (both sexes)(mm)	803	673	742	752	724
Avg. size of females (mm)	894	881	869	922	864
Avg. size of males (mm)	734	622	658	698	671
% of kings between 508-635 mm	25% (591)	54% (249)	39% (278)	33% (186)	52% (122)
% of kings under 508 mm	23% (1,133)	19% (420)	51% (814)	34% (482)	38% (426)

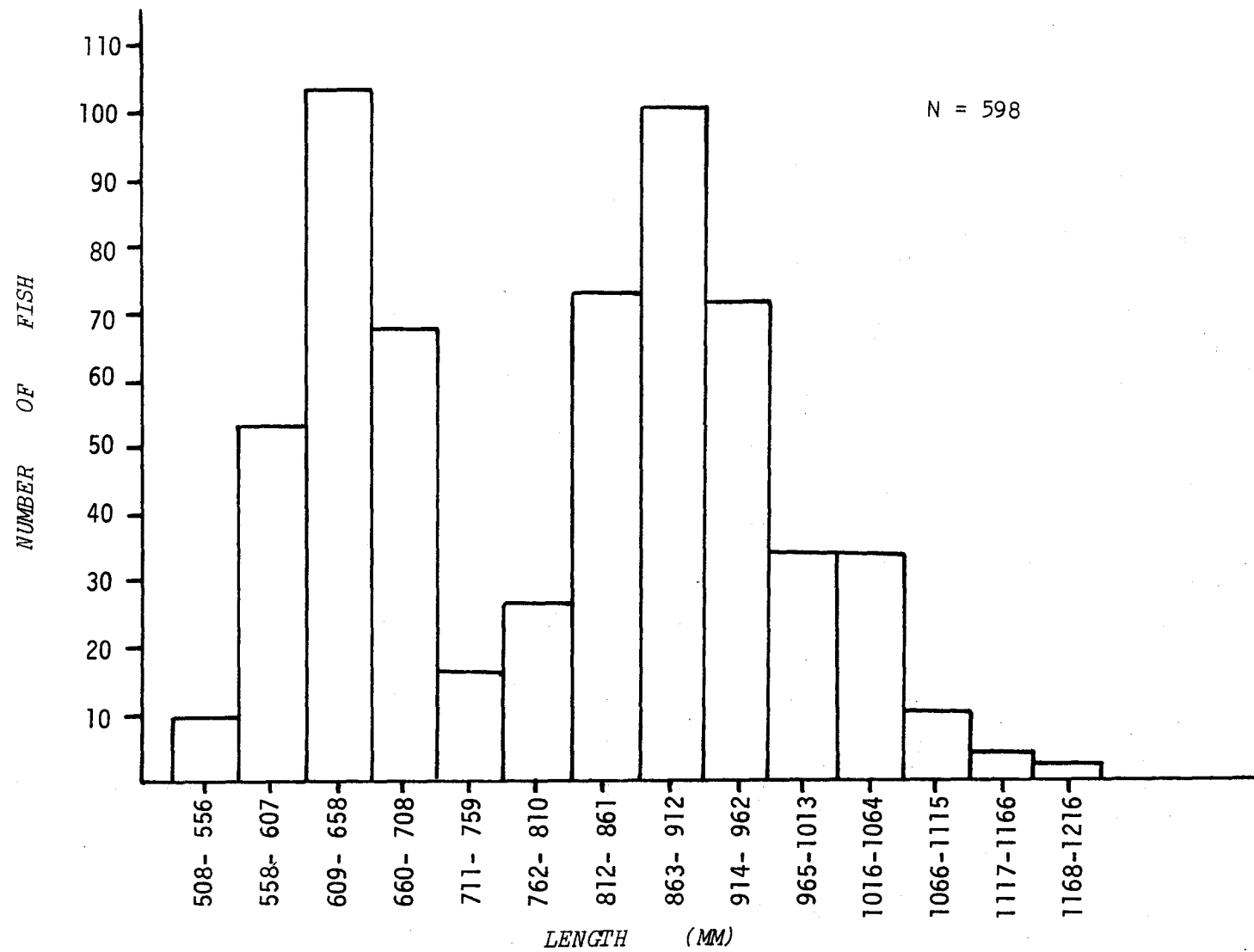


FIGURE 1 SIZE COMPOSITION OF SPORT-CAUGHT KING SALMON 508 MM AND OVER FOR UPPER COOK INLET STREAMS, 1970.

In 1970, the average size of the fish was larger than in past years (Table 1). Again, this could be attributed to the timing of the fishing season and the availability of larger fish.

In addition to kings 508 mm and over, a total of 262 "jack" salmon under 508 mm were caught by anglers during the punch-card fishery. The average size of these fish was 380 mm in length and two pounds in weight. Anglers find the "jacks" a highly desirable sport fish, and as previously discussed, these fish are included in the general daily freshwater bag limits.

### King Salmon Escapement

The 1970 king salmon escapement counts were estimated, based on spawning area observations by both aerial and ground surveys.

Population enumeration of king salmon was attempted on seven streams studied during the past seven years (1964-70). Table 2 presents the escapement counts for Upper Cook Inlet streams from 1964 through 1970.

TABLE 2 King Salmon Escapement Counts, Upper Cook Inlet Streams, 1964-1970.

<u>Stream</u>	<u>1970</u>	<u>1969</u>	<u>1968</u>	<u>1967</u>	<u>1966</u>	<u>1965</u>	<u>1964</u>
Deshka River	5,286	5,652	4,863	2,500	2,000	2,749	2,422
Alexander Creek	562	735	727	500	300	400	205
Lake Creek	189*	1,540	1,300	1,000	300	172	290
Chunilna Creek	58*	375	1,000	**	300	8	319
Totals	6,095	8,302	7,890	4,000	2,900	3,329	3,236
Ship Creek	1,746	710	500	200	50	207	94
Campbell Creek	63***	**	125	300	15	119	116
S.F. Eagle River	81***	**	28	50	49	159	123
Totals	1,890	710	653	550	114	485	333

\*Poor count - water high.

\*\*No count available.

\*\*\*Carcasses.

Indications are the adult king salmon escapement into the Deshka River and Alexander Creek on the west side of the Susitna River appear to be one of the highest recorded. Escapement count figures in Table 2 do not reflect the sport fish harvest which more than tripled during 1970. The estimated harvest of 843 king salmon (all sizes) from the Deshka River, in addition to the enumeration counts, indicates an overall escapement of some 6,129 kings in the system.

A total of 234 king salmon carcasses checked on the Deshka River ranged from 432 - 1,181 mm. Males averaged 782 mm and females 930 mm (Figure 2). The dominate age group for this sample was five-year (1.3) fish. The male-to-female sex ratio was 1.1:1.

The Alexander Creek king salmon sport fish harvest increased from approximately 24 fish in 1969 to 424 (all sizes) in 1970. Overall escapement for Alexander Creek, including the sport fish harvest, was estimated at 986 kings.

High water and poor observation conditions prevented any estimations of adult king salmon in Chuniilna and Lake creeks. One fact is clear, however, whatever the escapement has been during the five-year period (1966-70), the sport fish harvest in these two streams has not adversely affected the spawning population (Table 1).

Three streams in the Anchorage area, South Fork of Eagle River, and Campbell and Ship creeks, received larger returns of king salmon in 1970 than in 1969. Population enumeration on Ship Creek during 1970 indicates the highest count on record. Escapement totals for all three streams are presented in Table 2.

#### Ship Creek:

A total of 424 king salmon carcasses checked on Ship Creek ranged in size from 356 - 2,321 mm. Males averaged 907 mm in length and females 958 mm. The carcasses examined consisted primarily of five- and six-year-old adults. The male-to-female sex ratio was 1.8:1.

#### South Fork - Eagle River:

A foot survey on August 13 revealed 81 king salmon carcasses on the South Fork of Eagle River. A total of 51 were sexed and measured. The carcasses ranged in length from 457 - 1,245 mm with an average of 990 mm. Males averaged 1,000 mm and females 985 mm. Five-year-old fish were the dominate age group in this sample. The male-to-female sex ratio was 1.3:1.

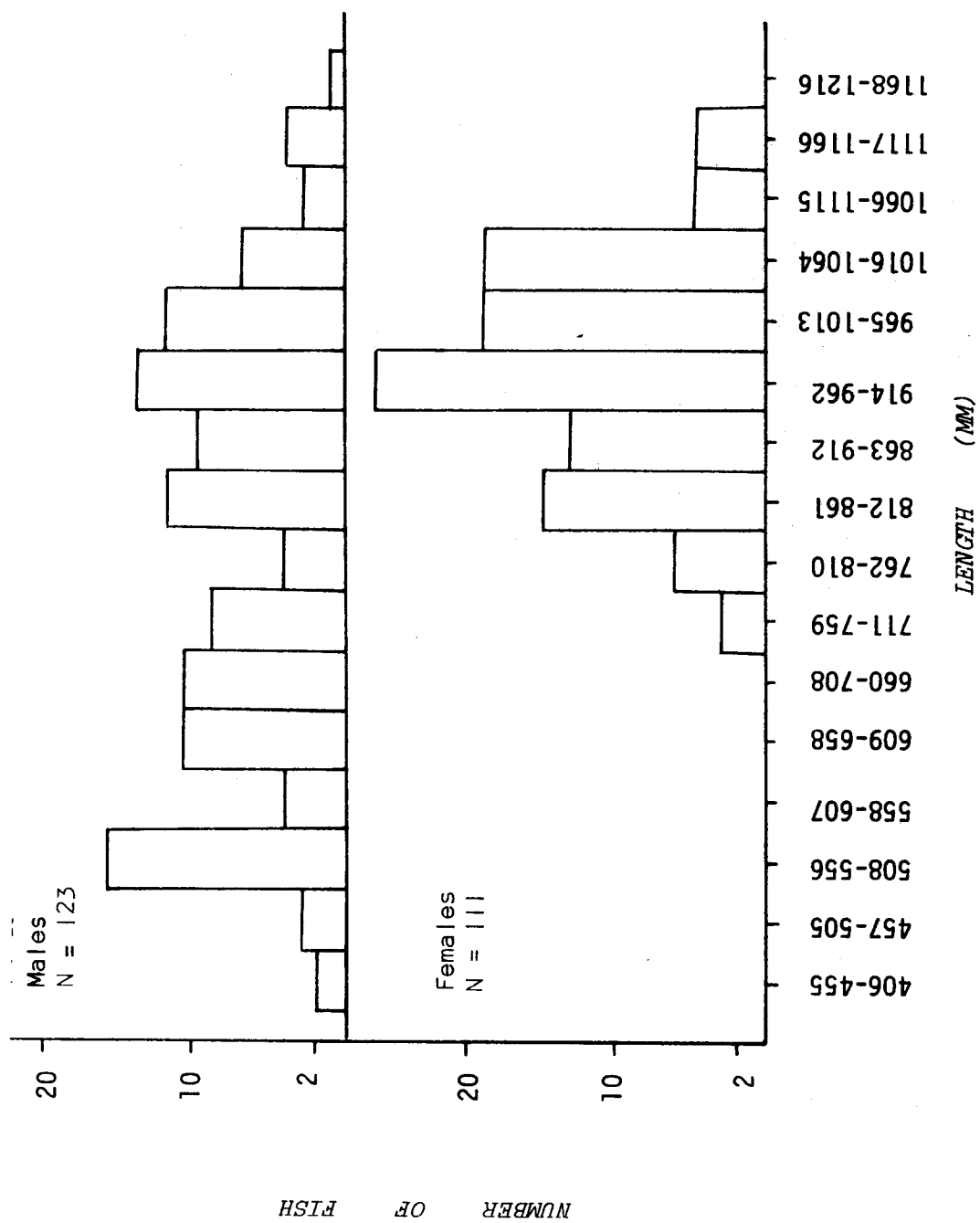
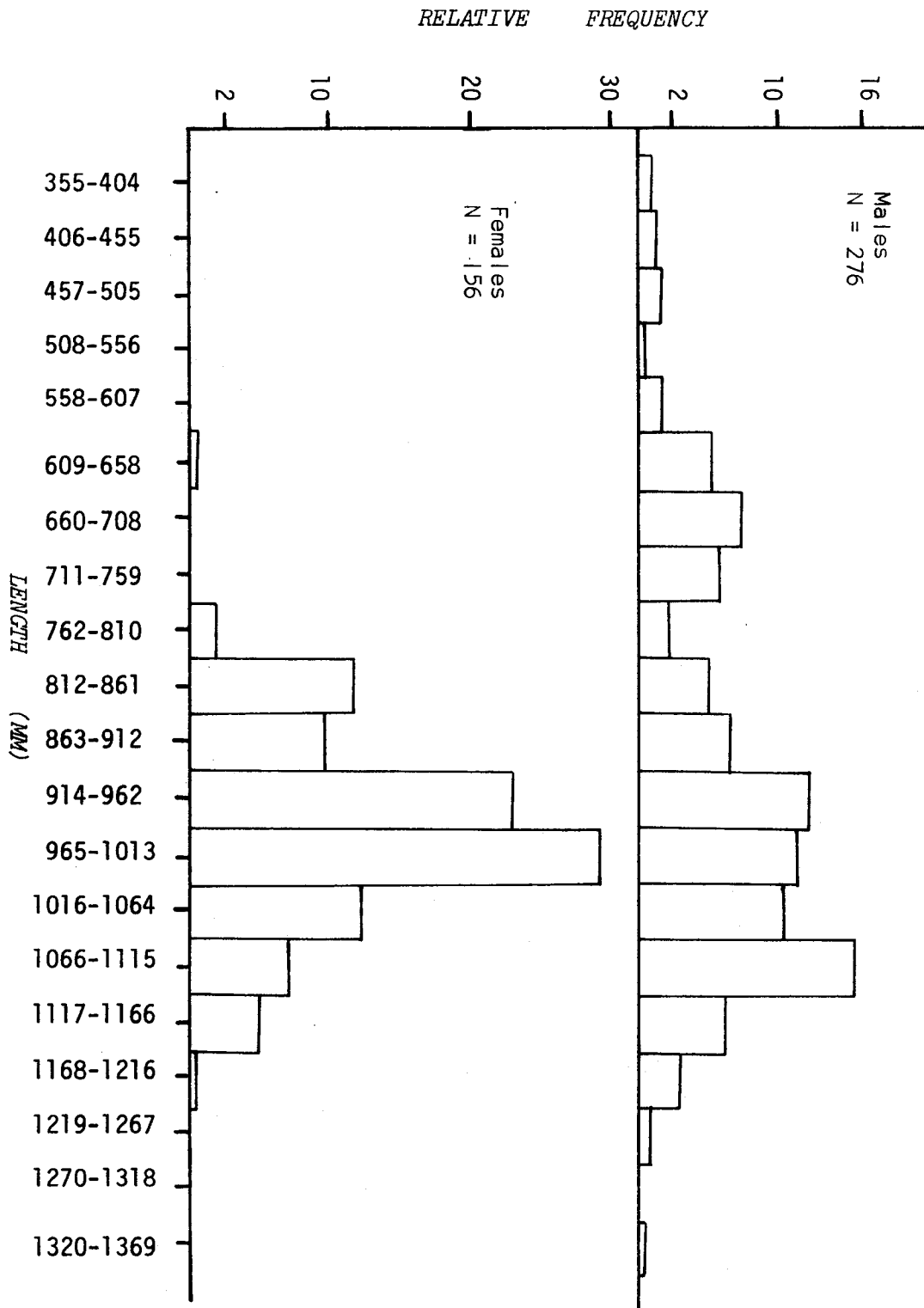


FIGURE 2 SIZE COMPOSITION OF KING SALMON CARCASSES, DESHKA RIVER, 1970.



FIGURE 3 LENGTH FREQUENCY OF KING SALMON CARCASSES FROM SHIP CREEK, 1970.



Campbell Creek:

Sixteen carcasses checked on Campbell Creek ranged in length from 813 - 1,041 mm. Nine males averaged 955 mm and seven females averaged 930 mm. The dominate age group was five-year-old (1.3) fish.

Silver Salmon Harvest

Silver salmon, *O. kisutch*, enter the west side tributaries of the Susitna River in mid-July and usually continue to run into September. Strong runs of silvers normally occur during even-numbered years in Cook Inlet, but the 1970 sport fish harvest on three west side streams showed a marked decline from the other even years (Table 3).

TABLE 3 Silver Salmon Sport Harvest, West Side Susitna River Tributaries, Even-Numbered Years, 1962-1970.

<u>Year</u>	<u>Stream</u>	<u>Tot. Anglers</u>	<u>Angler Hrs.</u>	<u>Tot. SS</u>	<u>Fish/ Angler</u>	<u>Fish/ Hr.</u>
1970	Alexander Creek	134	670	187	1.39	0.28
	Deshka River	54	378	65	1.20	0.17
	Lake Creek	<u>31</u>	<u>124</u>	<u>80</u>	<u>2.58</u>	<u>0.64</u>
	Totals	219	1,172	332	1.51	0.28
1968	Alexander Creek	272	978	337	1.23	0.34
	Deshka River	231	921	190	0.82	0.20
	Lake Creek	<u>64</u>	<u>209</u>	<u>67</u>	<u>1.04</u>	<u>0.32</u>
	Totals	567	2,108	594	1.04	0.28
1966	Alexander Creek	432	1,296	553	1.28	0.42
	Deshka River	375	1,398	353	0.94	0.25
	Lake Creek	<u>84</u>	<u>252</u>	<u>105</u>	<u>1.25</u>	<u>0.41</u>
	Totals	891	2,946	1,011	1.13	0.34
1964	Alexander Creek	88	169	106	1.20	0.62
	Deshka River	<u>518</u>	<u>2,202</u>	<u>805</u>	<u>1.55</u>	<u>0.36</u>
	Totals	606	2,371	911	1.50	0.38
1962	Alexander Creek	731	2,018	1,414	1.93	0.70
	Deshka River	<u>313</u>	<u>872</u>	<u>470</u>	<u>1.50</u>	<u>0.53</u>
	Totals	1,044	2,890	1,884	1.80	0.65

The age composition of Upper Cook Inlet adult silver salmon is composed of three- and four-year-old fish.

Creel census data obtained from the Deshka River, Lake and Alexander creeks disclosed that 219 anglers caught 332 adult silver salmon, for a seasonal success rate of 1.5 fish per angler.

#### Lake Creek:

Some creel census records were made between August 7 and August 9. During this period, 80 silver salmon were caught by 31 anglers at the confluence of Lake Creek and the Yentna River. Seventy-two silvers were measured and sexed. The silvers ranged in size from 483 - 686 mm, averaging 577 mm. Males averaged 599 mm, whereas females averaged 551 mm. The female-to-male sex ratio was 1.2:1.

#### Alexander Creek:

The peak of Alexander Creek silver salmon fishing activity occurred from July 20 through July 31. Creel checks showed 134 anglers taking 187 silver salmon. Size of the silvers ranged from 457 - 686 mm, with an average of 569 mm. Males averaged 574 mm, and females 561 mm. The sex ratio of females to males was 1.1:1.

#### Deshka River:

Fifty-four anglers checked on the Deshka River caught 65 silver salmon. These fish ranged in size from 457 - 686 mm. Males averaged 589 mm, while females averaged 582 mm. The male-to-female sex ratio was 1.6:1.

#### Silver Salmon Escapement

Due to high water conditions during 1970, no reliable estimates were made on silver salmon populations on the west side streams along the Susitna River. Escapement count techniques are limited to aerial and ground surveys which depend on good stream and flying conditions. It is hoped that with the installation of the new Bendix fish counter on the Deshka River, reliable enumeration of silvers can be obtained in that freshwater system, regardless of stream and weather conditions.

### Sonar Counter

During 1969-70, the Sport Fish Division procured a Bendix Corporation sonar salmon counter from the Commercial Fisheries Division. Results of the field operations were disappointing as counting accuracy varied inconsistently. Much of the variation in counting accuracy was due to:

1. Lack of adequate water over the transducers.
2. False counts caused by outboard motors passing over the facility.
3. Breakdown of counter components.

The Sport Fish Division recently (December, 1970) purchased a new salmon counter from the Bendix Corporation. This counter will be installed in the Deshka River during 1971 in anticipation of adult king and silver salmon counts. Hopefully, personnel familiarization with the counter's function, operational problems, and limitations will eliminate the above-mentioned problems, and the counter will become a useful tool for enumerating adult salmon.

### Ship Creek

Approximately 5,000 anglers participated in the first king salmon fishery to be held on Ship Creek in 10 years. An estimated 50 kings were caught by anglers fishing within the Anchorage city limits.

A king salmon punch card was required by all anglers and the same bag limits set for other Cook Inlet streams applied to Ship Creek.

Only one small segment of the stream, from a marker 300 feet below the Chugach Power Plant Dam to its confluence with Cook Inlet, was open to fishing. The rest of the stream was closed to protect spawning adults.

The catch success was extremely low when compared to the large number of anglers fishing the creek and the estimated number (1,746) of kings in the creek. The low catch was due to the fact that the peak of the run had already passed and most of the kings were above the Chugach Dam. If the season was set two weeks earlier (June 20), a larger number of kings would have been caught. The largest king salmon caught weighed 42 pounds.

Prior to the early 1940's, Ship Creek, near downtown Anchorage, supported substantial runs of king, silver, chum, O. keta, and pink salmon, O. gorbuscha. Many factors over a 30-year period have caused a gradual depletion of the salmon stocks. The population of Anchorage has increased from about 3,000 inhabitants in the early 1940's to approximately 130,000 in the surrounding area in 1970. With the population increase came progress and economic development and, as a result, the anadromous fish runs have decreased.

Water development projects have also played a big part in the depletion of the valuable Ship Creek salmon stocks. Between 1942 and 1952, four dams were built along the stream; three were a total barrier to adult salmon migrating upstream.

Three steam power plants built along the creek released their effluents into Ship Creek waters, and the city of Anchorage helped by depositing their raw sewerage in the lower portion of the creek.

Spawning gravel has been continually removed with total disregard to fish life for the sole purpose of construction activities.

In recent years, Ship Creek has received rather extensive illegal fishing pressure on salmon which has also contributed to the decline of the fishery.

Ship Creek has had a very restrictive salmon sport fishery the past 10 years. Following are some of the regulations imposed since 1960:

- 1960 - closed to all sport fishing.
- 1961 - closed to salmon fishing.
- 1962 - closed to salmon fishing.
- 1963 - closed to salmon fishing.
- 1964 - open to salmon fishing, except king salmon,  
below the Chugach Dam.
- 1965 - same as 1964.
- 1966 - same as 1964, except hook size restricted to  
1/2" single hook.
- 1967 - same as 1966.
- 1968 - closed to all fishing January 1 through August 31.  
Sport fishing with single hook only 1/2" or less.  
Salmon fishing allowed only below Chugach Dam.  
No king salmon season.
- 1969 - same as 1968.
- 1970 - king salmon season, July 4 through July 19.  
Punch-card fishery. One king per day, two  
per season. Restricted to fishing below  
the Chugach Dam.

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